Interactive comment on "Soil phosphorus dynamics on terrestrial natural ecosystems" by Leonardo Deiss et al.

Anonymous Referee #2

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Phosphorus is an essential nutrient for life that limits productivity in many terrestrial ecosystems. However a big knowledge gap still needs to be filled concerning on P cycling dynamics in the soil, as a complex interaction of mineral, biological, and climate factors. This paper addresses this question analyzing a wide dataset, trying to extract general or global patterns that could help to complement the current knowledge of this important biogeochemical cycle. Despite the paper presents an interesting dataset and a significant goal, I could not recommend publication without major revisions. The writing should be improved, paying attention to shorten and simplify phrases. It also requires a better organization of the main ideas or messages the authors want to transmit. It is not clear the take-home message of the paper; especially the conclusions should be improved. I also have some important comments on the focus of the discus-

sion. However, the data compilation proves that behind this publication there is already a large work, for this reason I would encourage the authors to work to improve the manuscript.

General comments

- The writing of the paper needs to be improved. The paper is dense and hard to read like it is. - The main messages to take home are not clear, these must be highlighted. - There are to many bivariate graphs that distract to understand the main messages. I would suggest to add most of them for the supplementary material and keep in the main text the ones that are significant and are used to describe main processes in the text - The authors present the patterns shown as global, but there is no reference on the role of different biomes and plant communities, which are in turn related to soil properties. Ecological implications for the relations seen are missing. - Because of the distribution of the dataset, where most of the samples are from New Zealand, the authors should address the associated bias that the data could have. - The authors consider the weathering status as a temporal proxy (as it is said in the abstract) to be crossed with soil and climate properties. However, weathering status in this paper is defined by soil type, which makes this classification at certain point redundant with soil properties and climate. The authors should clarify this decision. - To assume organic C as total C is only acceptable in organic soils. This assumption can lead to large errors in calcareous soils. - Why the path analysis is used to explain exclusively diester/monoester ratio and not other P-form? Is this ratio providing specific information on nutrient state of the ecosystem? Is significant for understanding P-limitation or inorganic control over the P cycle? This should be argued. - I miss a clear explanation on the role of the basement/parent material.

Specific comments

- The last sentence of the abstract is not telling anything new "organic and inorganic P pools as well as their functional groups composition are determined by distinctive

drivers that regulate key ecological governing their presence. . ." - Pag 2, line 22, which 5 factors? - Pag 4, line 27, starts a list with "a) " but no more items are listed - Pag 7, line 25, the no effect of many climatic variables can be related to the geographic bias of the dataset. Should be argued. - Pag 8, line 10. Is obvious that poorly crystalline Fe and Al, do not correspond to weathering status if we consider the classification status than the authors have used. However, the presence of these oxides can deeply influence the P pools and cycles in Oxisols and Ultisols but also Andosols. - Pag 9, line 10. This is a too ambitious sentence. There is no information presented in this study about the variability among communities or different biomes. It is not explained neither how some edaphic variables depend on climate. - Precipitation and moisture index give similar bivariate relations, maybe with one of both variables would be enough.

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